The Scientific Review,

AND

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SUBJECT MATTER INDEX OF APPLICATIONS FOR PATENTS.

August 20th to September 20th inclusive.

The following Index gives first the class, then the name of the Inventor. In this list (com.) means Invention communicated from abroad. Further information as to the progress of these Patents by Notice to Proceed, Sealing, and Specifying, can be obtained at the Office, 21, Cockspur Street, Charing-cross.

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⁂ *The above List is prepared from the Patent Records by Mr. T. Morgan, Secretary of the Inventors' Patentright Association, Limited.*

Messrs. William Cornwall, sen., William Cornwall, jun., and Aaron Cornwall, of Louisville, Ky., have recently patented an improved machine for mixing materials suitable for making soap, also for mixing other plastic or pulverulent materials for other purposes. The improvement consists in the construction and arrangement of the rotating arms employed for creating currents, which move in opposite directions, but in different parts of the materials placed in the mixing vessel or receptacle.

Reviews.

MESSER ON BRITISH WILD FLOWERS.

A New and Easy Method of Studying British Wild Flowers, by Natural Analysis. Being a complete Series of Illustrations of their Natural Orders and Genera, analytically arranged. By FREDERICK A. MESSER. London: David Bogue, 3. St. Martin's Place, Trafalgar Square, W.C. 1880.

THIS work is of a character seldom met with, for it is most elaborate, and withal highly instructive; in fact it smooths the student's path to an extent that no one would imagine could be done who does not see the book itself. In the Introduction the nature of the work is fully explained, and an ample Glossary sets forth in detail the various matters described, symbolical illustrations and abbreviations following this. Also a list of natural orders; then follows the analyses of classes, of divisions, of orders, and of genera; to which is added a chart of species, a catalogue of British plants, an index of the orders and genera, and of English names.

It is impossible for us to do anything for this work in the way of quotation, and as the price is not very considerable, we can only recommend our readers to get the work and make use of it, and they will find that no words of praise of ours could be more than the mere utterances of just judgment. The main feature of this very useful work is, however, the adoption of what Mr. Messer terms Symbolical Illustrations, which are nothing more nor less than delineations of the leaves, styles, stamens, and such like arranged in tabulated form, on one page, with explanatory notes on the opposite page, both being arranged as to order, class, and so forth.

THE SMITHSONIAN INSTITUTION.

"Annual Report of the Board of Regents of the Smithsonian Institution." Washington: Government Printing Office. 1879.

THIS Annual Report of the Smithsonian Institute is one of great interest, so great indeed that it would be difficult to name any former report which could outvie it. But we had scarcely needed to have stated this much if we had said that it contains biographical memoirs of Profs. Joseph Henry and Louis Agassiz. Condorcet is likewise the subject of a biographical treatise. Amongst other matters worthy of notice are the Report of the Secretary; Appendix to the Report; Journal of Proceedings, &c.; Henry and the Telegraph, by William B. Taylor; The Effect of Irritation of a Polarised Nerve; Researches upon Fever, by H. C. Wood.

HINE MOA, THE MAORI MAIDEN.

By JOSEPH EARL OLIVANT, Author of "A Breeze from the Great Salt Lake," and Translator of "The Court of Mexico," by Countess Paula Kollonitz. A. R. Mowbray & Co. London: 65, Farringdon Street, E.C. Oxford: 116, S. Aldate's Street.

THIS is a pleasant little volume, a good notion of which may be gathered from the following prefatory remarks:—

"A few words as to the origin of the following tale may be permitted.

"I have always been much interested in New Zealand from childhood, when the even tenor of life in a village bordering on the fen districts was pleasantly disturbed by the war-whoops, songs, and dances of a Pakeha Maori. The performance took place in the village schoolroom, and is the first public entertainment within my memory.

"My friend, who called himself Pa-he-Rangi, did not let much light in upon his personal history, only telling us that he was taken prisoner, forcibly tattooed, became of great importance, and finally married, amidst the cheers of the tribe, his chief's daughter. He remained obstinately silent as to the whereabouts of the dark Mrs. Pa-he-Rangi, and Mrs. P. the second assisted his performance by an occasional jingle on the musical glasses. He was, if my memory fail not, a Scotchman, and probably commenced his career as a fugitive from some ship.

"At any rate, his finely tattooed face, his flax mats, his wild songs and dances, his spear with a tuft of flowing flax as an ornament beneath its point, his weapons in general, and especially his tomahawk, into one end of which, by removing the spike, he ingeniously stuffed tobacco, and puffed the smoke through the stem: these curiosities, and, above all, his stamping of a savage war dance with wild gesticulations, were calculated to impress children very much; and for some time after this some of us smeared our faces, tied door-mats round our persons, stuck cock feathers in our hair, and, making spears which we decorated with tow, and imitation-tomahawks, stalked about as Maori chiefs in the kitchen garden, to our great satisfaction.

"It was a terrible blow when at school some years later, to find the celebrated New Zealand chief living in a small house near the station digging potatoes in his garden instead of brandishing a spear, and to meet him in the streets dressed in the unromantic garb of England, instead of in woven flax with war paint on his face. There was in fact nothing left for the fond imagination, except to wonder if Mrs. P. No. 2 still jingled together the glasses in order to relieve for him the monotony of civilised life, and whether No. 1 still pined for the deserter. Perhaps it was she who composed the Maori lament, beginning:

'My regret is not to be expressed,
Tears like a spring gush from my eyes,
I wonder whatever Te Kaiuku is doing,
He who deserted me, &c., &c.'

"Peace be with her! she is not without a sympathiser, for the memory of Pa-he-Rangi in his full beauty of tattoo on the Sunday-School boards, abides yet green in my affections.

"Again: the tale of Missionary work in the Pacific: the 'Night of Toil:' 'Polynesian Researches:' the stories of cannibalism, whalers, and general adventure, were well calculated to inspire the young with a vague fascination, as in fact was the whole history of New Zealand from the year 1769, when Captain Cook took possession of the islands in the name of George III.

"Further: the names of Te Heu Heu, Heke, and William King; the episodes at Kororareka, Ohaihau, and Oheawai; the Wanganui and Waikato wars; the creation of a Maori king; and finally the exploits of Te Kooti, were quite sufficient to add to the interest excited by Pa-he-Rangi, and accordingly an opportunity that occurred later of passing a few months in New Zealand was hailed by the writer with much satisfaction.

"The native legend of Hine Moa—a slight tale in the original, but popular among the Maoris—has been adopted as a vehicle by which to record the impressions received and observations made on the occasion of my visit, and as a peg upon which to hang a picture, however indifferent, of Maori life and customs, before they pass away for ever. The original sketch was written at Auckland a few years ago, and filled up since at leisure moments. My intention has been to write as simple a tale as possible in simple language, and using the simplest images, putting it into the mouth of an aged Maori. At the same time this last endeavour has much increased the difficulty, the possibility being thus destroyed of using a host of European images. Moreover the paucity of the Fauna, as compared with that of other lands—the class of indigenous quadrupeds for instance being blank—is a great loss to a writer where illustration is necessary. Add to this the difficulty of imagining what modes of thought Maoris would employ, more especially under the delicate circumstances of love-making. As to the illustrations, I have tried to use none or few that are palpably false, or that a Maori may not be acquainted with, or have heard of, owing to his intercourse with Europeans; such as those drawn from the habits of bees or deer.

"Two institutions of the Maoris have been omitted in text, which ought perhaps to have been touched upon, namely those of Muru and Utu; but as 'the Pakeha Maori' has not long since republished his work, *Auspice Duce*—no! an Earl, his pages may be referred to, to complete somewhat an imperfect picture, and some mention of them will be found in Appendix F. My scattered notes I have thrown principally into the form of articles, as being more compact in this shape; easier for reference; and forming thus with the Poem a more united whole. Three of these appeared in the columns of 'The Field,' and are reprinted by kind permission of the Editor. Frequent reference has been made to Thompson's 'Story of New Zealand,' and other sources, in the hope of presenting a fairly accurate picture. A line or two here and there in the songs is adapted from native originals.

"The reader is requested for his own convenience to cast his eye over the Appendices before reading the Poem."

FREE TRADE AND TRADE UNIONISM.

"Free Trade and Trade Unionism. By a SHIPOWNER." W. J. Potts & Co., Printers and Publishers, North Shields. 1880.

ALTHOUGH we usually abstain from mixing up with subjects of political or socio-political character, yet as the pamphlet before us treats of questions which are at the present day of momentous import, we deem it desirable to bring it under the notice of our readers; especially as we hold to the notion that, however well established any principle in any department of knowledge may be, it ought to be allowed to be questioned by those who have some understandable arguments to advance against it—and we feel the more disposed to open our columns occasionally to adversaries of accepted theories as we know there is scarcely any reliable organ of public opinion that will take any notice of their arguments. Notwithstanding therefore that it is now almost heresy to dispute the value of free trade; yet, finding as we do, that the author of this little work puts forth some observations worthy of consideration, we now bring same under the notice of our readers, and in doing so we deem it desirable to place before them his introductory statement, that owing to the insulated position of this country, all its international trade must of necessity pass through the hands of the shipowner. As a rule, he is better paid for carrying imports than exports, and so cannot be influenced by class interests when advocating a policy that would result in an increase of home-grown food. The following remarks on our Free Trade policy, therefore, may be accepted as unbiassed, whatever their other merits may be.

As regards that portion of the work which refers to Trades Unionism, we must remark that whatever may be the evils that may happen to be mixed up therewith, they have to our mind nothing whatever to do with Free Trade; unless, indeed, the effect of Free Trade be that by the operation of very severe competition wages must be forced down to starvation point, which would of course be to trades unions a *casus belli*. Indeed, Trades Unionism may more easily be squared with protection than free trade, as the author alleges to be the case by his statement (p. 5) that the rules and practices of Trades Unionism "are nothing if not intensified protectionism."

The postulates of our author are these :—

1st. All the food we import must be paid for. A nation can no more avoid this condition, than an individual can obtain food and clothing without paying for them.

2nd. England could not only exist, but continue prosperous for all time, even though she did not grow a tithe of her consumption, so long as she paid for her supplies by her labour, exported minerals or manufactures of equal value to her imports.

3rd. The balance of 142 millions [of imports as against exports] is an annual and irrecoverable loss, the importance of which may be best seen by considering that a relatively small increase of taxation of four millions may at times be sufficient to oust a Government.

4th. Money taken from the people by taxation, sent down to our dockyards and arsenals, and circulated back into the community through the workmen, is not so injurious to the nation as money or values taken from it and sent abroad, never to return.

5th. Nearly all classes are supported by working to supply the artificial wants of their neighbours; so no class interest can be injured without affecting prejudicially the whole nation, as its destruction removes a circle of purchasers.

6th. Free Trade as now practised by England has injured instead of assisting us. Free Trade, by an unfortunate coincidence, has received credit not its due, and this mistake, like an "*Ignis fatuus*," is leading us to ruin.

7th. Free Trade has not cheapened food, nor prevented the effect of bad harvests.

8th, 9th, and 10th refer to the circulation of money, and to remarks in furtherance of those already mentioned. The 11th is the one as to Trades Unionism, which has evidently originated in misconceptions of facts, and the adoption of some fallacies. Free Trade and Trades Unionism (says "Shipowner"), although at first sight appearing remote as the Poles, are yet so intimately connected that one cannot be thoroughly considered without the other. This is the result of England's inability to grow sufficient for her own consumption. The surplus must be paid for. To pay for it by our manufactures we must produce them cheaper than the foreigner. This will be impossible if the efforts of labour are artificially restrained and its value increased by arbitrary measures which force it above what the law of supply and demand would give. It is necessary before proceeding further (we still quote) to understand who are consumers, because the interests of the consuming classes are put forward on every occasion by Free Traders as a plea for their views. Let these Free Traders show that the nation, or even the great majority of it, is composed of people with greater interests as consumers than as producers. If they can prove this, they prove their whole case, as certainly it would be unjust to follow a course that would injure the people of this country in the interests of a few producers. The whole contention centres itself here. If it can be shown that the nation is *not* divided into a majority of consumers on the one side and a few consumers on the other, the greatest stumbling-block to a consideration of the effects of Free Trade will be removed. Let us try and find a person that is a consumer and not a producer as well. Nay, go a little farther and try to discover one who is not overwhelmingly more interested in this nation's commercial affairs as a producer than as a consumer. Is he to be found among weekly workmen, or in the salaried classes? Are we to find a specimen among Government employes, or among those who live on interest, Government securities, or railway dividends? It is impossible to enumerate the whole, but take at once the most extreme case possible. Search among pauper children to find one interested less as a producer than as a consumer. Does not the very existence of every one depend on the manufactures, agriculture, and trade of this country? Every imaginable salary, wage, or pension, would disappear if you destroyed these three. Are not revenue and taxes derived from them? Could Government pay salaries and dividends if there were no revenue,—and is it not of vital importance to the pauper child that he should have a prosperous community to come to and work in? We think that no one will dispute that "How to get a living?" is a far more important question than "How to save 5 per cent. on our purchases?"

He proceeds to combat the assertion that freedom of trade must of necessity be correct, seeing that it gives liberty of action, allowing every one to buy and sell in the cheapest and best market.

There can be no doubt as to the advantage of Free Trade in principle; it is in its practical application that a difference of opinion exists. It is not a question of what would be best under certain conditions that do not exist, but one of what is most profitable under the present order of things. Had Free Trade been adopted by all other countries, and so given us the true freedom of commerce that is implied in the term of "Free Trade," there would possibly not have been a dissentient voice in this country, notwithstanding that it would have materially injured some important interests. We believe in the principles of honesty and confidence, and desire the universal extension of them; but it is not therefore inconsistent with this belief, that while the world is being reformed we bolt our doors and act with reserve, except to those we can trust, and who fully reciprocate our confidence. And so it is with Free Trade. We must take a practical view of it, and not a merely sentimental one. Now, it professes to give freedom to trade, but what freedom has it given us? It has given us greater liberty for buying abroad without extending our opportunities for selling abroad, and at the same time it has partially closed our home market against our own goods—as in the case of refined sugar for instance. If we are producers more than consumers, Free Trade must be to us a misnomer. Let us see what a common sense business man would do if such a form of trade were proposed to him for adoption.

His shop is in a good business neighbourhood, but provisions, and other household requirements, are five per cent. dearer than at a short distance where rents are cheaper. Notwithstanding this, he buys in his own neighbourhood,—and why? Because he knows that unless he buys from his neighbours they will remove their custom from him, and because he recognises that a matter of five per cent. extra on his own household expenditure is as nothing compared with loss of trade. And why would other shopkeepers remove their custom? Because they know the purchases of the tradesmen in the neighbourhood form a considerable item in each man's account. But, say some, this is not a parallel case :—the removal of the neighbours' custom would not be a necessity of trade, but a result of pique. Whether the motive in removing custom be retaliation or not, the result is the same, viz.,—a fostering of the trade of a neighbourhood to the benefit of all. And, in fact, the very dissatisfaction would often arise not so much from anger as from a desire to check an offence against the first and best recognised principle of commerce, viz., fostering a business connection. How often do you hear it said of a successful man—"He had a good connection, and skilfully kept it together." Our Free Trade is contrary to the recognised principles of all other relations, as it tells you to disregard your market or trade connection in making your purchases, and to buy even from those who refuse to purchase from you, if their goods are in the least the cheaper, and that even although the difference may be so slight that in all the more important articles of consumption it is almost inappreciable to the customer when retailed out. Our Free Trade blinds itself to the fact that by this refusal to purchase within your own connection or home market, you impoverish it, and thus contract your opportunities of selling, without any compensating opening abroad. As a nation, we should carry out the individual practice of buying from those who will trade with us upon well regulated tariffs, giving preference to our own countrymen, and to those foreigners who will accept our goods on a reciprocity of Free Trade principles.

We have now given some prominent points in this work, and as space will not allow of our making further quotations, we must leave all interested to refer to it themselves.

RECENT AMERICAN AND FOREIGN INVENTIONS.

MR. WILLIAM R. PHILLIPS, of Milford, Del., has patented an improvement in fruit driers, which consists in combining with slotted walls slides, cleats, and movable cross bars.

Mr. Gerhart Rauman, of Middletown, Conn., has patented a spring closer for doors, gates, and blinds, so constructed that it will close a door, gate, or blind however much or little may be opened.

Mr. Edward P. Haff, of New York city, has patented a double crochet needle formed of a tube into each end of which a crochet needle is inserted. These needles may be fine or coarse, and may be replaced by others when desired, and are inverted in the tube when not in use.

Mr. John McAnespey, of Philadelphia, Pa., has patented an improvement in ice cream beaters, which consists in a novel construction and combination of a vertical barred beater and an automatic scraper for removing the ice cream from the interior surface of the can.

Mr. Emil P. Raether, of New York city, has patented an improved bottle stopper especially adapted to bottles containing syrups, bitters, and other fluids used in restaurants.

An apparatus for filling casks and bottles with lager beer or other liquor impregnated with air or gas under pressure, so constructed that the pressure may be regulated as desired and without wasting the liquid, has been patented by Mr. J. C. G. Hüpfel, of New York city.

A simple and efficient apparatus for extinguishing fires has been patented by Mr. Lewis A. Folsom, of Dalton, Ga. The invention consists of two barrels or other vessels, set one within the other, the outer one containing sulphuric or other acid, and the inner one carbonate of soda or other alkaline carbonate, and into the latter vessel a third vessel, containing gunpowder or other explosive, is introduced, the explosive vessel having a fuse or tube filled with powder connected with it and extending upward through the cover of the other vessels, so that fire applied to the tube or fuse will be communicated to the explosive in the interior vessel, and cause an explosion which will burst asunder the containing vessels, and thereby cause their contents to mingle, generating a sufficient volume of carbonic acid gas to extinguish the fire.

Mr. Gennaro Rossi, of New York, has patented a paint composition for woodwork, walls, and the bottoms of vessels, to produce a waterproof surface, and on vessels to prevent the adherence of barnacles and grass.

Mr. William L Gerard, of Junction city, Kan., has patented an improved tether, which permits of keeping the animals within a limited space without requiring a long rope or strap or strong and insurmountable fences. The invention consists in an anchor or like device attached to the halter strap of the animal, so that if the animal steps over the low fence surrounding its pasture, the anchor catches on the top wire of the fence, thus holding the animal.

An improved holder for tape, braid, &c., has been patented by Mr. Edward P. Haff, of New York city. It is formed of a U-shaped spring clamp, with a double slitted cross piece and roughened or serrated shanks adapted to clasp the sides of the material.

Messrs. Jules and Charles Schmerber, of Paterson, N. J., and Jules A. Arrault, of New York city, have patented a machine for grinding and mixing plastic compositions or substances, such as pyroxyline compounds or other of which the solvents or part of the ingredients, being volatile, require working in closed apparatus to prevent loss of the volatile portions. The inventors make use of a hollow cylinder for receiving the plastic material, formed with a steam jacket and fitted with a piston that is to be reciprocated by suitable power, and the cylinder is connected by passages at its opposite ends with the grinding machine, so that by the movement of the piston the material is forced back and forth, through the grinder, until the operation of mixing and grinding is completed.

Mr. Mark L. Mount, of Pearsall's, N.Y. has patented an improved matched hook, made of two parts, one of which carries a square stemmed pivoted button and locking springs, the other part being slotted to pass the head of the button.

A simple and convenient machine for cutting potatoes and other vegetables into uniform slices and strips has been patented by Mr. Jessup Whitehead, of Leadville, Col.

An improved adjustable attachment for carriages, which furnishes a good support for baggage, has been patented by Emma J. Osborne, of Anderson Court House, S. C. The invention consists in a frame or platform pivoted at its outer end between two arms, the inner ends of which are pivoted between two arms connected by a transverse rod and having the upper ends curved so as to form hooks, by means of which they are hooked on to the spring bar of the vehicle.

Mr. Daniel F. Hallahan, of Philadelphia, Pa., has patented a machine for trimming and burnishing the edges of soles of boots and shoes. It consists of two spiders of equal diameters and having an equal number of arms that are fixed upon a shank or shaft between two circular discs or guides, which guides are of slightly greater diameters than the spiders, together with the cutters or burnishers that the spiders carry on the ends of their arms; and it further consists of tangential cutters or burnishers (the cutters and burnishers being interchangeable) adjustably fixed on the ends of the spider arms by means of screws that pass through slots in said arms, the spiders being so arranged that the cutters or burnishers on the one fit into or opposite the interspaces between the cutters or burnishers upon the other, and so that while one of the spiders remains fixed the other may be approached or withdrawn from it, whereby the device may be adjusted and applied to soles of any thickness.

An improvement in extension settee tables has been patented by Mr. Morgan Gossett, of Russellville Ohio. The invention consists of a table having stationary legs and a movable leg and a pivoted extension top that can be horizontally or vertically adjusted, as may be desired, by a novel arrangement of devices, while between the legs seats are arranged.

A car for transporting live stock by railway has been patented by Mr. Francis Rieber, of Callicoon Depot, N. Y. It consists in novel details of construction and arrangement of stalls, feed racks, water troughs, hay lofts, and water tanks, and devices connected therewith, weereby provision is made for securing the comfort and preserving the health of the animals occupying the car.

Messrs. Jacob A. Swinehart and Lafayette Jourdan, of Rushville, Ohio, have patented an improved drag sawing machine, which consists of a beam or bench supported at the rear by legs and in front by a guide block, which rests on the log to be cut. Two levers are pivoted in and extended downward through mortices in the beam, and are connected at the lower ends by a pitman, and to the forward one of these levers is pivoted the saw shank, the saw extending forward and through a cut in the guide block.

The curative properties of an electric current may be adapted to the treatment of different diseases by taking advantage of its different qualities as developed under varying conditions. The current may have great intensity and little quantity, or it may have great quantity and little intensity. It may be continuous or intermittent, or it may be made to alternate, so that electrical impulses of different name will rapidly succeed each other. There are two methods of generating electrical currents for curative purposes—one by chemical means, as in the various forms of battery, the other by the direct conversion of mechanical energy into electrical energy, as in the magneto-electric machine. Magneto-electric machines have not generally been considered as efficient for curative purposes as batteries, on account of the difficulty experienced in constructing a machine capable of yielding the different qualities of current required for the treatment of different subjects. Mr. Thomas W. Livingston, of Ainsworth, Iowa, has invented a magneto-electric machine capable of yielding currents varying in their character, so that its range of application will be wider than that of batteries, while it is more compact, more manageable, more easily adjusted, and operated by either skilled or unskilled persons.

Mr. Joseph W. Putnam, of New Orleans, La., has patented an improvement in the class of pile drivers in which the hammer guides or leaders are hinged to permit their inclination, for the purpose of driving piles at various angles.

Messrs. Martin E. Morningstar and John W. Roberts, of Arkona, Ontario, Canada, have patented an improved car coupling of the class called self-couplers; and the improvement consists in the peculiar construction of the link holder.

Mr. Peter Josserand, of Hockley, Texas, has patented an improved valve gear for engines, which consists of a lever, a shaft, and two friction wheels of different diameters for receiving motion from the crank shaft and transferring the motion at an increased velocity to the valve shaft.

Mr. Hans Knüdson, of De Forest, Wis., has patented a dynamometrical engine governor, by means of which the work performed by the engine and the strain upon the driving wheel regulates and controls the steam supply.

Mr. Tiry S. Pylant, of Ridge Spring, S.C., has patented improvements in turbine water wheels of that form in which a horizontal wheel is enclosed by a case having upon the top oppositely opening trunks or conduits for delivering the water to the wheel, which trunks have flaring mouths and taper downwardly into the plane of the wheel.

An improvement in well-boring apparatus has been patented by Mr. Harry Samuel Gail, of Waukegan, Ill. The object of the invention is to provide means for holding the auger to the rotary shaft in such a manner that they may be really disconnected to allow of the withdrawal of the auger without disturbing the shaft.

An improved railroad rail, intended to prevent the noise produced by its vibrations, has been patented by Messrs. Henry V. Piaget, of Jersey city, N. J., and Frederick A. Piaget, of New York city. The invention consists in applying a thick layer of cement or like material to the sides and bottoms of the rails, and fastening strips of wood to the sides and bottoms of the rails by means of the cement, thereby preventing the emission of sound by the vibrations of the rails.

Mr. John L. Taylor, of Las Vegas, Territory of New Mexico, has patented a telegraph pole that is more durable and lighter than ordinary poles, while having the requisite strength.

Mr. Nicholas Boren, jun., of Haubstadt, Ind., has patented a novel arrangement of a churn dasher rod and a series of shafts and band wheels, and a drum and weight, whereby provision is made for obtaining a rapid movement of the dasher.

The combination, with a map, of index sheets secured by their upper edges to the map roller and pendent on the side of the may, has been patented by Mr. Orson S. Haskell, of Evanston, Ill.

An improved car coupling has been patented by Mr. Jesse T. Rice, of Grand Rapids, Mich. The invention consists of a novel combination of devices, which cannot be clearly described without engravings.

Mr. Abraham F. Denliger, of Jamton, O., has patented an improved gate, so constructed that it can be opened and closed by the wheels of a passing vehicle. It is simple in construction and not liable to get out of order.

A light, strong, and durable fence, which is easily set up, taken down, and moved from place to place, and is inexpensive in manufacture, has been patented by Mr. Henry E. McWhorter, of Blooming Grove, Ind.

COMPRESSING FLUID STEEL.—A proposal has been lately made in some quarters to effect the compression of fluid steel by placing in the ingot mould on the top of the fluid metal a charge of nitrate of soda or other solid which evolves gas on being heated, the top of the ingot mould being then closed, and the pressure due to the gas generated being allowed to act on the fluid steel. With reference to this proposal it may be worth while to record that this mode of operating was proposed—and we believe patented—by M. Antoine Galy-Cazalet, of Paris, some thirteen years ago. M. Galy-Cazalet proposed to use a mixture of 80 parts of nitrate of soda with 20 parts of charcoal, the mixture being introduced through a cock fitted to a cap affixed to the head of the ingot mould. With a space of 30 cubic inches capacity between the fluid metal and the ingot mould cap, the introduction of $\frac{1}{4}$ oz. of the mixture is stated to give a pressure equal to that of a head of metal 90 ft. high. We do not know whether this mode of operating was ever regularly applied in practice; but if it was it would be interesting to know the results.

TRADE MARKS (SWITZERLAND).—We have received the following notification from the Trade Marks Registry Office:—"A despatch has been received through the Foreign Office from Her Majesty's Minister at Berne, containing copies of the trade marks deposited at the Federal Bureau between the 1st of May and the 31st of July last for subsequent registration in Switzerland. It is very important that persons using trade marks in Switzerland should inspect the official publication containing a transcript of the trade marks applied for, as the period for lodging objections to the registration of these marks terminates on the 30th of the present month. The publication can be seen at the Trade Marks Registry Office, 25, Southampton-buildings, Chancery-lane, between the hours of 10 and 4."

The Scientific Review

AND

SCIENTIFIC AND LITERARY REVIEW,

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THE INVENTOR'S INSTITUTE,

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ESTABLISHED 1ST MAY, 1862.

Past Presidents:

SIR DAVID BREWSTER, K.H., LL.D., F.R.S., &c., from the establishment of the INVENTORS' INSTITUTE, till his decease, February, 1868. LORD RICHARD GROSVENOR, M.P.

President, SIR ANTONIO BRADY.

THE SESSION 1879—1880
IS ENDED.

The Balance Sheet 1879-80 can now be inspected.

Subscriptions are payable to Mr. G. A. STRETTON, the Receiver, 4, St. Martin's-place, S.W., who is the proper official to give receipts.

F. W. CAMPIN, Sec.

Proceedings of the Institute.

The Institute being out of Session, there is no business to report.

The new Session of the Institute will begin early in November. It is proposed to commence the Session with a Dinner, as in some former years. Those members who may wish to attend it will greatly oblige by communicating with the Secretary without delay.

Monthly Notices.

The Electric Light.—**The Museum of Practical Geology will, it is reported, be illuminated by electricity, same to be introduced immediately after the recess.**

The Indian Government have taken energetic steps to institute tidal observations at some of their principal ports, and the results will be published in the form of tide-tables. The observations are reduced by Mr. E. Roberts, of the *Nautical Almanac* Office, by the system of harmonic analysis, which has been adopted for the reductions carried out under the auspices of the British Association. The number of ports for which tables for 1881 will be forthcoming is seven, viz., Aden, Kurrachee, Bombay, Carwar, Beypore, Paumben, and Vizagapatam. We understand that some preliminary tables have been already checked on the spot in India, and have been found to be remarkably accurate. The number of ports will be increased to about twelve in 1882, and eventually to twenty-two, the full number for which it is contemplated to issue tide-tables. It is very gratifying to find the Indian Government taking such useful measures on behalf of shipping interests and navigators in general, and we hope it may serve as a stimulus to our own Admiralty, which might, perhaps, with advantage display more enterprise in its hydrographical labours.

Coal of a peculiar character M. A. Inostranjeff, in the *Neues Jahrbuch für Mineralogie*, describes as found near Lake Onega in Russia. It is much richer in carbon than ordinary anthracite, containing, when free from water, 98·11 per cent. The pure varieties show a strong metallic lustre, which is not destroyed by a dull red heat. Its hardness varies from 3·5 to 4, and its density at 4° C. is 1·841. Analysis gives carbon 95·50, hydrogen 0·40, nitrogen 0·41, water, and ash.—*Athenæum.*

The Rev. Arthur Rigg.—We regret to announce the death of the Rev. Arthur Rigg, M.A., which occurred at his residence, Warrington Crescent, on the 2nd September. At a time when the scientific education of engineers was almost unknown in England, Mr. Rigg had established workshops as far back as 1844 in the College at Chester, where he was Principal for thirty years. Here, during the interval between theoretical studies, the students carried on various handicrafts, carving both the stone and wood work for their beautiful chapel, and subsequently making tools, lathes, and steam engines, &c., and many engineers received their early training under his auspices. He read a paper on "Mechanism" before the Society of Arts in 1872, and gave a most original series of lectures on "The Tools and Contrivances used in Handicrafts," in 1875. As a member of the Royal Institution and kindred societies, he regularly watched the general scientific progress of the age, and to the very last took a keen interest in all engineering pursuits.

Cause of the Acid Reaction of Animal Tissues after Death.—Marie Ekunina says that the acid reaction is due to a decomposition of the fluids in the tissues effected immediately after death by the action of Schizomycetes. At first volatile fatty acids appear derived from the incipient decomposition of the albumen, speedily followed by the two lactic acids produced from glycogen. The richer a tissue in carbohydrates, the longer this acid reaction prevails after death, as in the liver, the muscles, and the lungs. It is briefest and faintest in the pancreas. In the later hours of putrefaction, the lactic acids disappear and are succeeded by succinic acid. Sooner or later an alkaline reaction sets in throughout the tissues, much ammonia being evolved from the decomposition of the albumen.

Purification and Refining of Fatty Matters.—To recognise if an oil is pure M. Octave Allaire takes a piece of carbonate of soda (crystal), the size of a nut, dissolves it in its own bulk of water, and shakes it up with the oil under examination in a bottle. If the oil becomes turbid, and gives on settling a solid bulky deposit, it has been badly purified. Oils which act upon the metal of lamps and form deposits of verdigris are also to be rejected as impure. Commercial samples often contain 10 to 15 per cent. of free oleic acid.

THE
Scientific and Literary Review

OCTOBER, 1880.

SANITARY PROGRESS.

SANITARY Science has recently been brought as prominently before the public as it has ever been since the time when men of position and scientific attainments first deemed it wise to give some attention to matters which are of the deepest interest to all of us. The Sanitary Congress, which has just been meeting at Exeter, under the presidency of the Earl Fortescue, who has been supported by Sir Antonio Brady (President of the Inventors' Institute), the veteran Mr. E. Chadwick, Mr. Rawlinson, and others, appears to have done as much good work as has ever been accomplished at any former meeting.

The Exhibition, or Museum, which is to be kept open till 9th October, has proved particularly interesting. It was intended that the awards of a gold and other medals for the best exhibits should have been made, but the judges could not finish their examination in time, and these, therefore, stand over. The first class of exhibits is connected with construction and machinery. The second consists of articles and appliances connected with sewerage and water supply; the third, of appliances connected with heating, lighting, and ventilation. The fourth relates to personal hygiene, foods, and disinfectants. In the first class there are sanitary wall papers and decorative materials. But perhaps the most attractive of the exhi is the ingenious system of warming buildings and rooms by corrugated iron plates is presented by our esteemed friend Mr. G. E. PRITCHETT, F.S.A., &c., of London, who in the same class shows his little instrument for giving an alarm in case of fire. A thermometer so balanced that in case of a rise in temperature the mercury causes the instrument to act so as to ring an electric bell. There are also "forecasting" barometers exhibited by other inventors. The inventions in the second class, for providing houses with properly constructed baths, appliances for water supply, and means of cleanliness, are very numerous, and at a cost suited to the conditions of all classes. In the third class some cheap and ready means of increasing the light of the gas jet without increasing the consumption are shown, and excellent stoves for warming and cooking. The fourth class includes some new drinks of the non-alcoholic character. Dr. Hinckes Bird, late medical officer for Blackpool, gives the public the benefit of his invention for "costless ventilation." Altogether there are some thousands of exhibits, and the public of Exeter and the adjoining towns have shown great interest in the instructive display.

We have not space enough at our disposal to give anything like a general review of the proceedings hence must be content with selecting something noteworthy and instructive, and for this purpose we cannot do better than present our readers with an epitome of the address of Sir Antonio Brady, as President of the Section on Geology and Meteorology, who has entered very actively into the general business of the Congress, presiding at meetings outside his own section and so forth.

Sir ANTONIO BRADY, in the first part of his address, reviewed the history of the earth, as evidenced by geology, and urged that it would be seen that many and vast changes had been and were still being effected by the hand of man, though not always for the better or for his own well-being. In respect to "climatology" the speaker quoted many text-books, and contended that the destruction of trees in the plains of India was the cause of the arid nature of the land. Coming to the subject of the poisoning of the atmosphere in large towns, he said that to obtain the blessings of plenty of pure air, pure water, and wholesome food for the people was the object of sanitary science and sanitary legislation. But modern sanitary legislation had to a great extent failed in its object. It was a notable example of how not to do it, for it placed the power of dealing with and abating nuisances mainly in the hands of those who created them, and it was only in very serious cases, with great difficulty and expense, that public opinion was able to compel local authorities to put the Acts in force. These public authorities seemed to be under no responsibility; they consisted mainly of officers appointed and removable by the large ratepayers, who, some of them being manufacturers carrying on noisome trades and living at a distance, thought more of saving the rates and less of the health or comfort and happiness of the populous neighbourhoods cursed by their unwholesome factories. The whole mischief of noxious vapours being driven off into the atmosphere might be avoided if only the vicious system of permissive legislation were changed, and the law compelled the authorities, however appointed, to put the law in force, and held them personally responsible by fine or imprisonment for neglecting their duty. Especially sanitary inspectors and medical officers of health should be appointed by the State; but, however appointed, they should be protected by it in the performance of their duties. Sir Antonio had the misfortune to live in the far east of London. When he was a young man and first came to live there, more than 40 years ago, the place was a suburban village, and the population of the whole parish was under 10,000. By the improvements in London, and the removal of the dens of St. Giles, the City, Shoroditch, and Whitechapel, the population had been driven east, and West Ham was now a town of more than 120,000 inhabitants, daily increasing. It had also become a new centre of industry, and, by the formation of magnificent docks, a very important part of London. The Metropolitan Board, having regard to the metropolis only, drove the filthy factories of Bow-common over the border into Essex. They took refuge in the adjoining parish, West Ham, where, in the midst of a crowded parish, they carried on their noisome trades with impunity, mainly owing to the protection given to them by the curse of permissive legislation. Animal charcoal makers, artificial manure makers, blood boilers, chemical works, and other kindred trades (if allowed at all to come into populous places) should be compelled to use retorts or other means which science could point out to remedy this state of things. The speaker dealt exhaustively with the subjects of water, sewage and marsh fever, which he held was due to the decomposition of vegetable matters, and he enforced the necessity of a rigid adherence to the laws of health. The Bishop of Exeter, in moving a vote of thanks to Sir Antonio, spoke of the high value which should be placed upon this compendious paper, which had brought before the audience matters with which most of them were unacquainted, and he would specially benefit the nation in calling attention to the causes of climatic changes in India—changes which had affected the well-being of vast populations. Mr. R. Rawlinson, C.B., who seconded the motion, while agreeing with much in the address, said that tree-felling might modify climate, but he could not agree that it would create great features of change. As to the causes of malaria, or marsh fever, he said he had studied the subject in different countries, and had arrived at the conclusion that this evil was caused principally by filthy habits of life. Dr. W. B. Richardson dwelt upon the importance of attention being directed to the cause of momentons changes of climate in parts of India—changes which led to the periodical famines among large populations.

The vote of thanks was then carried and acknowledged.

Proceedings of Societies.

ENTOMOLOGICAL SOCIETY.

SEPT. 1.—H. T. Stainton, Esq., V.P., in the chair.—Miss E. A. Smith, Assistant State Entomologist of Illinois, was elected a foreign member.—Mr. J. J. Weir exhibited specimens of *Odonestis potatoria* and *Smerinthus populi*, which possessed the peculiarities of both sexes.—Sir S. Saunders exhibited six winged examples of the Stylopideus, genus Hylecthrus, and also various other Hymenoptera, and contributed remarks thereon. Miss E. A. Ormerod exhibited some galls found on *Tenacetum vulgaris*, which she described at length. Mr. T. R. Billups exhibited a female specimen of *Polyblastus Whalbergi*, an ichneumon not previously recorded in Britain.—Mr. E. Boscher exhibited living specimens of the two varieties of the larvæ of *Smerinthus ocellatus*, and contributed a note thereon.—Mr. Meldola exhibited some specimens of *Camptogramma bilineata*, a large number of which had been found by Mr. English near Epping, attached firmly to the leaves of the "tea tree" (*Lycium barbarum*) by the abdomen, in which position they had died, possibly from the effects of fungoid disease.—Mr. A. H. Swinton communicated a "Note on *Luciola Italica*," an Italian fire-fly.

BRITISH ARCHÆOLOGICAL ASSOCIATION.

THE thirty-seventh annual Congress meeting of the British Archæological Association commenced on Monday, the 16th August, at Devizes, under the presidency of Earl Nelson. After the two meetings of immediately preceding years at Wisbech and Yarmouth the Association gladly revisited westerly hunting-grounds. Twenty-two years have elapsed since the Congress of the Association met at Salisbury for the examination of Wiltshire antiquities, and probably very few of those who took part in this Congress were numbered among those who then explored the beauties of Salisbury Cathedral, the Gib Hill tumulus, or the earthworks at Old Sarum. The proceedings were inaugurated by a cordial reception at the Town Hall by the Mayor and Corporation of Devizes and the executive members of the Wiltshire Archæological and Natural History Society, a society which has flourished for many years and collected in the pages of its periodical magazine an immense store of topographical, archæological, and scientific information, by way of pendant to the colossal works on Wiltshire by Sir Henry Colt Hoare.

In the temporary absence of Earl Nelson, whose inaugural address upon the county antiquities selected for examination was postponed to a future opportunity, the Rev. A. G. Smith, of Yatesbury, a prominent member of the Wiltshire Society, cordially welcomed the members, and pointed out with great eloquence the leading features of ancient and mediæval Wiltshire. This county possesses, perhaps in a greater degree than any other in the whole of England, magnificent examples of the earliest works attributed to human agency on the globe. The British period, illustrated but sparingly elsewhere, here is well shown by the flake-strewn, barrow-studded downs; then comes the marvellous and mysterious megalithic edifice at Stonehenge and its larger, but perhaps less generally known companion in age, Avebury; Silbury, the largest artificial mound in Europe, with its adjacent stone circle; the Roman road at Wanshouse; Amesbury and Vespasian's Camp; the castles of Bratton, where the Danes once held their camp, and Devises; the monastic remains at Malmesbury—the home of the most vivid and most trustworthy of our chroniclers, William of Malmesbury—Bradenstoke Priory, and Lacock Abbey; and a large number of typical specimens of ecclesiastical and domestic architecture, all being included in the places put upon the programme for visitation during the eight working days at the disposal of the Association. Under the guidance of the Rev. H. A. Olivier and Mr. Henry Cunnington, Curator of the Devizes Museum, the extensive collection of antiquities recovered from excavations in the barrows preserved in that institution was inspected, and the party was then conducted to the churches of St. Mary and St. John, which were described at length by the Rev. Dr. Burges, rector of Devizes. Afterwards a visit was made to the remains of the ancient castle, renowned in the middle of the twelfth century in the wars of the Empress Mathildis, daughter of Henry I., who, as Mr. W. de G. Birch pointed out in a paper published some time ago is entitled to her place among the sovereigns of England by reason of her formal recognition by the Government then existing in England during the eventful years 1141-1142.

After visiting some buildings in the town, the members assembled in the Town Hall, and the President delivered his inaugural address, in which, after referring generally to the important bearing which these annual gatherings of archæologists had upon the furtherance of the study and the preservation of our historical relics, he proceeded to point out that the Association might assist in promoting archæological lore by preserving the old names of different fields and farms. Every field had a name, and many still retained them by mere tradition among the old labourers and in the old parish maps and terriers. Some of more modern date only referred to the size of the field on its comparatively recent allotment, such as "Hundred Acre," which generally meant "under an acre," and "Ten Furlong," or the like; but there were much older names than these, and if any one ever attempted to walk the bounds of an old Saxon charter many of the old names, if kept, would help out the boundaries, and the specified points on the boundary would give an explanation to the names. For example, Whelpley, Wellow, Landford, were a proof of the British being originally to the east of Christ Church Avon. Cerdic's battle at Charford drove the Britons to the other side, and caused the succession of forts from Old Sarum down the valley protecting the western lands to which they retired. A few years ago, in digging in a rabbit burrow, Lord Radnor's keeper came upon the remains of an old Saxon chief, with his sword by his side, who had evidently fallen in the moment of victory in the middle of the fortified pah which he had taken from the British.

On Tuesday, the 17th, at an early hour, a large party was conveyed in carriages to Potterne Church, which, with the ancient porch and church house, was described by the Rev. H. A. Olivier, Mr. E. P. Loftus Brock, F.S.A., and others. From this place the members proceeded to Eastwell, where the font, attributed to the very early date of the tenth century, and its remarkable inscription were inspected. The drive was then continued through Erlestoke to Edington, where the church and the monuments were examined, and a brief description of them given by Mr. J. R. Bramble and other members. After luncheon the church of Tinhead Bratton was visited, and the encampment at Bratton, by some believed to be the site of King Alfred's decisive victory over the Danes, explored, most of the visitors walking up the ascent and inspecting the well-known "White Horse." The return journey to Devizes was made through Steeple Ashton, whereby an opportunity was provided for viewing the church. Keevil with its church and fine examples of ancient timbered houses, and Poulshot Church with its interesting belfry. The long day was yet further extended by the reading of papers by Mr. J. A. Picton, F.S.A., and Dr. Stevens. Wednesday's proceedings consisted of a visit to the church of Bishop's Canning; an inspection of the Wansdyke, about two miles from the church; thence across the Roman road to Avebury, with a description of the megalithic circles by the Rev. A. C. Smith, to whom also the Association stands indebted for the description of the stone circle opposite the great artificial mound at Silbury, to which the party was taken through the celebrated Kennet avenue. On Thursday, Bradenstoke Priory, Dauntsey, and Malmesbury Abbey formed the principal portion of the programme.

SOME RECENT ADVANCES IN AGRICULTURAL CHEMISTRY.

THE above subject is treated in such an able and interesting manner by Professor Church, in his lecture at the Royal Agricultural College, delivered not long since, that we present the same for the perusal of our readers:—

Professor Church, who was loudly applauded on rising, said:—Ladies and gentlemen, my lecture this morning will be a somewhat fragmentary one, and a somewhat brief one, but I thought it might be of interest to you were I to bring before you a few of those recent researches in agricultural chemistry which have attracted my own attention in the last year or two. Let me open by saying a few words on the very beginning of the subject, viz., germination of seeds. It is a matter of great importance to farmers, as well as to horticulturists, to ascertain the germinating power of seeds, and also to learn how far their treatment with various chemical agents will favour germination, destroy germination, or detect those seeds which are not available or actually hurtful to animal nature. Now, first of all, let me mention to you the instrument which has been employed in most recent researches for ascertaining the germinating power of seeds. It consists of an earthenware pan or basin, with channels made for water, and the seeds being placed therein, the plan is to count every day how many seeds have germinated, it being found that from 80 up to 99 per cent. of our agricultural seeds will germinate. But there will also be found weed seeds among them, and these will be capable of being picked out. In this way you get a very good notion of the value of the seeds to be experimented upon. A former pupil at this college, an Italian, who took his diploma here some few years ago—I allude to Signor Giglioli, now Professor of Chemistry in the Agricultural College, at Portici, near Naples—has lately published a very interesting and important paper not only upon the germinating power of different seeds used in agriculture, but also upon the action of chemical solutions and gases and various liquids upon seeds. Although these researches have been going on for two years, Signor Giglioli is only just beginning to get into the heart of the matter, but I draw your attention to them on account of what he has found with regard to some seeds of low vitality. He finds that if he takes a sample of wheat seed, and grows it in a certain atmosphere, or rather if he treats it with certain gases, carbonic acid gas, oxides of nitrogen, &c., that no advantageous influence results on the germinating power of seeds. It has been stated frequently that these gases will produce an advantageous result, but it is now found that such is not the case. He also finds that many seeds have a marvellous power of resisting the deleterious action of certain gases, solutions, and liquids. Wheat grain will resist the action of a strong solution of blue vitriol, sulphate of copper, which is used to destroy fungi sometimes found on the grain, for a long period. In one case I believe the wheat resisted the action of the vitriol for nearly a year, and at the end of that time it still showed very nearly the same germinating power as the untreated seed did. Hundreds of similar experiments are recorded in these researches. He further finds that many of these seeds aged, or became less full of vital power, after being subjected to the gases or solutions, as they did in the air—that if there were less germinating seed after a few weeks in the treated specimens, it was simply because in the course of a few weeks in the ordinary specimens under ordinary conditions you get fewer seeds germinating. But he found one other fact of some importance. Supposing a few seeds of some thin-skinned sorts were mixed with the wheat, you can by the application of certain solutions cause the foreign seeds in the wheat to be killed. You can in fact by certain solutions poison certain seeds without injuring the wheat seeds. On the other hand many solutions will destroy the vitality of the grain, and not affect the thicker coats of other seeds. But you will see how this opens up the possibility of cleaning our seeds by chemical agents before use.—The learned Professor then passed on to draw attention to an important point connected with the green colouring matter of plants. They were aware that it was only a green leaf that could obtain carbonic acid gas, and feed itself from that constituent of the atmosphere, and it was thought that those cells of the plants which contained the leaf green had the sole power of performing that function. But a German experimenter, Pringsheim, last year found that the chlorophyll, or green colouring matter, seemed to act almost exclusively as a screen to prevent the destruction of the substance which really decomposed the carbonic acid gas, that the chlorophyll itself was not capable of performing that office, and that what was called the protoplasm or something contained in it was the real acting agent. Experiments were in process by which it seemed that green colouring matter other than chlorophyll would act as an effective screen to cut off the injurious rays of the sun, and only allow those rays to pass which permitted the protoplasm to decompose the carbonic acid gas.

FOLIAGE TRANSPIRATION.

Professor Church continued: The next research of importance which I have to bring before you is concerned with the transpiration of water from foliage. It has been proved by Messrs. Lawes and Gilbert that each ton per acre of air-dried produce, say each ton of hay from a field, involves the evaporation from the foliage of the grass or miscellaneous herbage which constitutes that hay, of 2½ in. of rain. But they have proved also, and nine or ten other observers have in past years shown that the results are in accordance with fact, that of the water that falls upon the soil in round numbers only 30 per cent. percolates, and 70 per cent. evaporates—that more than two-thirds of the water that falls in rain, dew, and mist on the soil, whether plants are there or not, will evaporate, and that this is largely increased by the presence of grass or any farm crop upon the surface of the land. You see the connection of these two matters. We have in the 70 per cent. of water that falls on the land and that evaporates, not a supply for the use of the hay crop or grass crop, because that portion evaporates independently to a great extent even of the amount that goes through the plant. Only 30 per cent. percolates, and you see this is an important matter in connection with the subject of water supply and drains. What Lawes and Gilbert have found is that according to the depth of the soil, so the amount of evaporation is greater. It is most singular, but the lower you go down you get less water percolating. It is not merely retained by the soil, but it finds its way up through capillary attraction to the surface, and so evaporates. Thus if you put a drain in at 9 in. you would find more percolation than you would at 18 in., and so it goes on diminishing till at a depth of 4 ft. 6 in. there is still a decrease of 1 per cent. in the amount of percolation. Now in connection with this subject, a great many experiments have been made by three or four different foreign experimenters upon the transpiration of foliage. One of our chief authorities has found that with respect to the Jerusalem artichoke one square metre of foliage lost in sunshine 65 grams of water, or more than two ounces of water for every square of 39 inches. In the shade, the same space only lost 8 grams, and at night only 3 grams. It has been found by the same authority that many other plants showed a similar difference, proving that the great evaporation of water was in sunshine and with the air in its ordinary condition of moisture. When the air is very dry, the transpiration seems often to diminish instead of to increase, in order thus to prevent the plant becoming desiccated. The same chemist concludes that an acre of beet or mangolds would in twenty-four hours consecutive and uninterrupted sunshine lose between 8,000 and 9,000 kilograms, or 20,000 lb. of water. This will give you an idea of the enormous evaporation from the crop independently of the evaporation from surface or the bare soil. One chestnut tree, twenty-five years old, exhaled in twenty-four hours 60 litres, or 13¼ gallons, of water through its foliage. The upper side of the leaf, on an average, exhales one part to 4⅓ parts exhaled by the under side of the leaf. Now this matter is connected with the absorption and decomposition of carbonic acid gas. When a leaf contain 60 per cent of water—it was the leaf of the lilac that was experimented upon in this instance—it was found that a square metre of leaves containing 60 per cent. of water, or rather less than the average amount, decomposed in one hour sixteen cubic centimetres of carbonic acid gas. This is the most important function in the plant, and it is to a certain extent dependent on the presence of the right amount of moisture in the plant, for when they were allowed to dry, the amount of carbonic acid gas decomposed decreased as the plants got drier, until when the plants contained only 29 per cent. of water they decomposed none at all. And now to speak of the relation between the amount of the water and the ash of the leaves. It has been found that the leaves of the common cherry laurel of our hedges in the first year contained 80 per cent. of water; in the second year, though the leaves are not larger, they contain 64 per cent. of water, and at that they stop. This is also the case with hundreds of plants experimented upon—they contain more water when in active work, and when the functions cease the water diminishes. Now this is intimately connected with the process which goes on in the plant; it is the migration of the constituents of the plant, which has been recently worked up by two German chemists. Leaves of the lilac gathered on the 15th April contained when dry 28 per cent. of albuminoid matter, 4·4 of ash, and 1·4 of phosphorus pentoxide. Leaves gathered on the 6th June contained 15 per cent. of albuminoid matter, 6·9 of ash, and ·77 phosphorus pent oxide. Leaves gathered on the 1st October contained 11 per cent. of albuminoid matter, 8·2 of ash, and ·46 phosphorus pentoxide. You see how the albuminoid matter diminishes, or at least the nitrogen, for although this is calculated as though all the nitrogen existed in the form of albuminoid substances, it would not be fair to call them all albuminoid matter. You see how the ash increased, and how the leaf became poorer as it grew older from the 15th April, through June, to the 1st October. The phosphoric acid had left the leaves; the ash had increased but was of a poorer quality; the nitrogen had gone to feed the other parts of the plant as well as the phosphoric acid. Some figures were more remarkable still. In the case of maple, on the 1st of May 100 parts of dried maple leaves contained 2·8 of phosphorus pentoxide, and on the 3rd October they contained only ·12 per cent., or less than one-twentieth of that contained on the 1st May. The phosphorus pentoxide had gone to feed the fruit and flowers of the maple, and had left the leaves. Now, not only is there the question of the migration of the constituents, but the nature of them is altered. In the case of the maple, there is 12 per cent. more lime in the old leaves than in the young, and 84 per cent. more silica. While the lime and silica are on the increase, the phosphoric acid and the nitrogen diminish, and recent researches show this very distinctly indeed. Chemists who have investigated this matter, have also worked upon the amount of water in the foliage. In the first year of their growth there was 77 per cent. of water in the cherry laurel, and in the second year 51 per cent. These figures are slightly different from those I gave you from another experimenter, but practically the same conclusion is arrived at, viz., that active growth of the plant demands not only the presence of large quantities of nitrogen and phosphoric pentoxide, but also of a considerable amount of water. The next point to which I will draw your attention is a paper published recently by two young chemists, Messrs. Bevan and Cross, upon fibres. This is connected of course with agriculture, as many of our important plants grown, not in England perhaps, but in Europe and many parts of the world, are cultivated for the sake of fibre used in the manufacture of textiles and papers which they yield. We have had a great difficulty in knowing anything of the chemical constitution of the matters found in fibre, and this paper, read on the 16th April of this year, and published at Manchester, is one of the most important contributions that has been made to this subject. These gentlemen have actually succeeded in getting substances out of fibre which have a definite chemical formula. We have always put down the composition of the fibrous parts of plants as consisting of two substances, cellulose, and a matter which for brevity's sake we call lignose. We did not know a great deal about lignose, but these gentlemen have found that this matter gives some perfectly definite compounds, and is not the vague substance we imagined it to be. The value of the research is that it enables manufacturers in preparing hemp or flax for the market to attack the lignose and remove it, without injuring the integrity of the fibre, and Messrs. Bevan and Cross's description of the method of doing this has brought about its introduction into several manufacturing centres. Thus we are enabled to operate on our fibres with some degree of knowledge, instead of at haphazard.

To proceed, there have of late been some fresh determinations of carbonic acid gas in the air. As you know, but for the plants consuming carbonic acid gas, neither man nor animals could live on the earth. We breathe the oxygen, and maintain our activity and warmth, and feed ourselves from the carbon consuming plants, &c. Therefore the quantity of carbonic acid gas contained in the air is most important to be ascertained. It has been thought four out of 10,000 cubic centimetres of air were carbonic acid gas, but it has now been determined that in pure air 2·942 parts in 10,000 are carbonic acid gas. Taking the air off a field of red clover in full flower the quantity was found to be 2·828, off a field of lucerne 2·829, so that while the open air contained 2·942, the clover or lucerne decomposed by their foliage a portion of the carbonic acid gas, and the amount was lowered. And so with a flock of sheep (not taking their breath), the reverse process would naturally occur, and there the amount of carbonic acid gas was 3·178 parts in 10,000, and near Paris it was 3·027, showing the influence of a large centre of population on the purity of the air. In all the figures the result is lower than the four parts in 10,000.

I had intended to have drawn your attention to some interesting researches lately made upon plants found to flourish upon soils of definite ascertained condition. Several interesting researches have been made lately upon this point, and a classification of the soils according to the natural herbage found upon them is being gradually elaborated. As you may all help in this work by observing what plants in a wild state grew on soils which may be afterwards submitted to analysis, you will see that this is a matter of great interest to everyone. Supposing that a soil contains 90 per cent. of sand and 10 per cent. of clay. Well, you will find that only six or seven plants can possibly grow on them. Then suppose that land was altered to contain 20 per cent. less sand, and to have added 20 per cent. of fine clay. The land would then grow most of our cereals and clovers. Tables have been prepared on this subject, and they are of great interest and value, for they tell us what plants, without any considerable amount of artificial manures, are most naturally suited for successful cultivation upon certain soils. In the same way with clay soils. With a high percentage of clay only a few plants can be grown, but if you add more sand and less clay you can grow all the plants you want on the farm. Some interesting investigations on the constitution of soils have already been made. For oats and rye it has been found you must have 1½ per cent. of carbonate of lime if you want a remunerative crop; that if there is to be a successful barley crop, there must be in the soil from 2 to 3 per cent. of carbonate of lime; and for the successful growth of first-rate wheat you must have from 4 to 8 per cent. of carbonate of lime, other things being practically the same.

The next point I have put down here is the question of reduced phosphates, and that is rather an important one, and has been worked upon in the present year. It has been found that the reduced phosphates commonly present in superphosphates kept some time can be best determined by treating the washed superphosphate (washed in pure water) with a strong solution of citrate of ammonia. And it is also considered by the experimenters who have studied the question that when you get an advantage in using superphosphates over insoluble phosphates, it depends more upon the state of the soil than upon the increased activity of the dissolved phosphate. If your roots are on sandy or peaty soil, and are only just on the surface of the ground, and their "feeding ground" lies but 2 in. or 3 in. below it, when the rain comes it does not wash the superphosphate out of the soil (for experiments prove that it does not occur in drainage water), but it sinks through the soil out of the feeding ground of the plants, and descends to a lower level, where it is not of so much use. But on other soils, where there is plenty of carbonate of lime, there the superphosphate distributes itself in the feeding ground of the plants, and it becomes available for the immediate use of the roots at a critical period of their growth. Therefore it is rather in the condition of the soils that we must learn the different manurial value of these compounds.

I had intended to have drawn your attention to another matter, but I can only name it without giving you any details on it. You know that in the last five or six years a great deal of attention has been paid to the nitrogen in food stuffs; that, in fact, it has been found that nearly all the old analysis of grasses and clovers and roots are utterly and entirely wrong. They are wrong only in one particular, but in one of the most important of all. Chemists knew it was not quite right, but they did not know how much it was wrong, and they thought the error was only a small one. It has been the custom of agricultural chemists to ascertain the amount of nitrogen present, and multiply it by 6·33 to arrive at the amount of albuminoids, or flesh formers. It has been taken for granted that all the nitrogen was really present in the form of albuminoid material. But the real fact was that some foods contained a half or three-quarters of their nitrogen in forms not of the slightest value as albuminoids. I will give you an exceptional case as an illustration. Lettuce will burn away readily to ashes because of the presence of saltpetre. But though saltpetre contains nitrogen it is of no use as food. If you analyse lettuce and multiply the nitrogen by 6·33 to get the albuminoids, the result is 6 or 8 per cent. flesh formers, the real amount being about 1 per cent. In beans and mangolds 1½ per cent. flesh formers have been considered as present; indeed as much as 1·818 per cent. has been found by the ordinary method of multiplying the total nitrogen by 6·33. But when determined by four other methods, all of which are more accurate, the results are 1·033 per cent., 1·397 per cent., 1·180 per cent., and 1·196 per cent. respectively, the method by which the 1·033 was obtained being I believe the most accurate. If you take beet, grass, potatoes, carrots, turnips, either leaf or roots, you will find there is a great deal of matter which is not albuminoid and yet contains nitrogen. Potatoes are a good example of it, because the error in the analysis of potatoes has led to the most curious complications and most perplexing to the student of the chemistry of the food of animals. Potatoes have been thought to contain more than 2 per cent. of albuminoids, and therefore animals ought to lay on flesh when given them. But if you add potatoes to fairly rich food the animals lay on less flesh than they should. This has perplexed many observers, but when it is explained that potatoes only contain 1·2 per cent. instead of 2·4 per cent. of flesh formers, all perplexity disappears, because the other 1·2 per cent. of nitrogenous substances which have hitherto been calculated as flesh formers are utterly useless for the building up of muscle. As the first experiments on this matter were made at this College in 1873-4, I thought it should be introduced here, particularly as it is a subject of the last importance in analysing on a scientific principle the food given to farm animals. In a paper read before the Cirencester Chamber of Agriculture on the 2nd of October, 1878, I gave the results of some of my experiments, but these have been confirmed by eight or ten German experimenters since. Whatever process is used all the results are so nearly accordant that we may accept the lower figures as really correct. And now I would just say in conclusion how glad I am to have had the opportunity of speaking again from this place, and I am sure I have to return my best thanks to you, and also to your principal, and to my friend Dr. Prevost, for having given me the chance of once more speaking in my old lecture-room.

An improved toy pistol has been patented by Mr. Henry S. Lockwood, of South Norwalk, Conn. The improvement relates to pistols having their barrels pivoted so that the breech may be swung upward to permit insertion of a cap or cartridge. The object of the invention is to dispense with the use of springs or catches for holding the barrel in place, and thereby simplify and cheapen the construction of the pistols.

TRADE MARKS AND CHAMBERS OF COMMERCE.

REGISTRATION OF TRADE MARKS.—The following letter has been addressed from the office of the Commissioners of Patents, London, by the clerk of the Commissioners to the Chambers of Commerce :—

"Sir,—

"I am directed by the Commissioners of Patents to request that you will be good enough to direct the attention of the Huddersfield Chamber of Commerce to the fact that after the 1st of January next the Trade Marks Registration Act of 1875 have been in force five years, and consequently that all trade marks which shall have been registered for that number of years, will under the third section of the Act referred to become the exclusive property of the owners thereof. Every endeavour has been made by the registrar to prevent the registration of marks commonly used in the various trades and industries of the country, but owing to the knowledge of many of such trade marks or signs being confined to comparatively speaking few persons in the particular trades and industries, it is possible that some common marks may have been accepted by the Registrar in ignorance of their nature, and that such marks are not only still upon the register, but will, under the Act of Parliament before alluded to, become, at the expiration of five years from the date of registration, the exclusive property of the persons in whose names they are registered. Under these circumstances it has occurred to the Commissioners of Patents, that it might be very desirable, in cases where it has not already been done, that the respective Chambers of Commerce should cause an examination to be made of the representatives of trade marks registered during the past five years, in so far as concerns those relating to the branches of trade industry each Chamber represents, with the view of taking steps to remove from the register, before the expiration of five years, any common marks that may be upon it, so as to prevent the right to use such marks passing from the general body of the trade into the hands of private individuals.—I am, sir, your obedient servant,

H. READER LACK,
Clerk to the Commissioners of Patents,
and Registrar of Trade Marks."

The rest of the meeting was mainly devoted to a discussion as to revision of a certain clause in the proposed new Great Northern Railway, and the Manchester, Sheffield, and Lincolnshire Railway Companies agreement.

EOZOIC AND PALÆOZOIC.

A CORRESPONDENT (J. W. Dawson, of Montreal) in a communication to our esteemed contemporary, *Nature*, thus writes :—Permit an old worker in fossils to protest mildly against the slapdash manner in which writers sometimes hit off great palæontological questions. In your review of Roemer's valuable "Lethæa Palæozoica" it is stated that in regard to *Eozoon canadense*, he "accepts the verdict of Möbius against its organic origin, and rejects it from the list of palæozoic fossils." Now as to the acceptance of the "verdict" in question, I have nothing to say, except that the naturalist to whom are assigned the functions of judge and jury in the case very obviously lacks some of the qualifications for that high office, and has not been recognised by those best qualified to understand the case of *Eozoon*. But why Roemer or your reviewer should "rejedt *Eozoon* from the list of palæozoic fossils" I am at a loss to understand. As a writer on palæozoic fossils, Roemer has nothing to do with *Eozoon*. It belongs to that great series of eozoic or archæan formations which precedes the palæozoic, and which probably represents quite as long a period. Little comparatively is known of the fossils of these oldest rocks; but what we do know of their *Eozoon*, *Archæosophorinæ*, *Spiral arenicolites*, and *Aspidella*, and of their immense deposits of graphitised plants, is sufficient to assure us that the life of the eozoic period was very different from that of the palæozoic; *Eozoon*, whatever its nature, is one of the most characteristic of these eozoic fossils. It has been recognised through a great vertical thickness of beds, and over so wide areas, that it is now equally characteristic of eozoic rocks in Canada and Brazil, in Bavaria and in Scandinavia. Further, it has obviously been connected with the accumulation of some of the greatest limestones of the eozoic time.

One can excuse a palæontologist familiar only with mesozoic or kainozoic fossils, when he doubts as to the organic nature of such obscure markings as *Oldhamia*, or even as to those wrinklings and scratchings on Cambrian slates which are recognised as trilobites and sponges; but we never think of asking him to accept or reject them as mesozoic fossils. In like manner those who are working out the dim traces of life remaining in the eozoic rocks will be content if geologists who scarcely condescend to recognise these great formations in their arrangements will abstain in the meantime from pronouncing judgment on eozoic remains supposed to be organic.

To us in Canada who have long regarded the eozoic formation as being quite as important in a physical point of view as the palæozoic, it is a matter of congratulation that they are now attracting so much of the attention of British geologists. Their palæontology, it is true, is still meagre, but our knowledge of it is gradually increasing, and those who have lived to see the Cambrian fauna grow from nothing to its present satisfactory condition need not despair of the Laurentian or Huronian.

IMPROVED TEA KETTLE.

PROBABLY our readers have often observed, in perusing our notices of recent American patents, that our Transatlantic cousins exercise much of their ingenuity in devising new arrangements for articles of domestic use, bringing invention to bear upon the improvement of articles of daily use, much to the advantage of home and family life. Amongst the latest of such efforts of ingenuity is an improvement in tea kettles, patented by Mr. W. S. Withers, and now being introduced by Messrs. Withere and Wolfe, 84, Whitehall-street, Atlanta, Ga., and described and illustrated in the *Scientific American*. This improvement is designed to prevent the possibility of the handle of the kettle becoming heated, a common occurrence with utensils of this class when placed over the fire, and also by the same arrangement to prevent the lid raising or moving from off the kettle, holding it firmly pressed down when it is tipped or inclined, thus avoiding the escape of hot water and steam. The invention consists in connecting the bail or handle — which is of the swinging kind, such as is adopted in pails—of the kettle with the lid or cover by a jointed rod, so that when the lid is closed upon the kettle the handle will be held erect, or, if the bail is turned over to the side, the lid, which is hinged to the kettle at that side, will be raised accordingly, and when the handle is grasped to raise the kettle, the lid is prevented from moving either vertically or laterally. When the lid of the kettle is closed the handle is held erect, and when the handle or bail is grasped and the kettle raised, the hinged lid will be held firmly against the body of the kettle over the orifice in its top, and thus prevent the escape of steam or water, as the lid cannot possibly raise or slip to the side, even though the kettle be turned half over in the direction of the spout.

The lid may be raised wholly or partially from off the kettle by depressing the handle which dispenses with the trouble and inconvenience of taking hold of the lid for that purpose, as is the case with the ordinary class of vessels of like character. The great advantage of this improvement is that the handle, not being permitted at any time to be in contact with the side of the kettle, cannot become heated.

EFFECT OF STARVATION ON THE BLOOD.

THE *Scientific American* has recently been devoting much attention to some physiological facts resulting from Dr. Tanner's fast; and states that it was noticed that the quality of the blood varied greatly in different specimens obtained from day to day, and even in specimens drawn the same evening. It was at last found that if the blood was drawn from a very small puncture, from which it had to be pressed out forcibly, it was found to be in a much worse condition than if drawn from a deeper puncture from which it flowed freely. It is evident that in the first case it was drawn only from the capillaries, and in the second case from the larger vessels, in which a regular circulation takes place. This appears to prove that the abnormal corpuscles linger in the capillaries, and that it takes time to remove them therefrom, while in the larger vessels, in which free circulation takes place, restoration may have already been accomplished to a considerable extent. Close observation appeared to show that this restoration was taking place in two ways, by a cleaning and healing process of the affected corpuscles, and by the formation of new ones. The first was proved by the observation of corpuscles in all stages of the healing process from the most abnormal to the perfect smooth ones. Some of those which had become free of fungoid spores appeared, however, to have suffered considerably, some were partially destroyed, some were only half or parts of perfect corpuscles, and no doubt such will be either eliminated from the system or the defective parts healed up. Which of these takes place is a question. The second process of restoration was proved by the appearance of fresh and small corpuscles, looking very smooth and perfect, and bearing the stamp of youthfulness upon their appearance—we would almost say countenance—a freshness which became more striking the higher the magnifying powers were by which they were observed, in comparison with the affected corpuscles, in which the higher powers showed the imperfections more strongly.

This corroborates what other microscopists have observed in regard to the formation of new young blood corpuscles. It has, however, been denied by others who failed to observe it; but this is merely negative testimony, of which there appears to be a great deal in the medical profession; it proceeds from a kind of conservatism, which lies at the basis of all the medical intolerance manifested by the so-called regular school against all supposed innovations, even among their own brotherhood.

A striking illustration was offered in this regard by the discovery of Prof. Cohnheim, of Kiel, who found that pus globules could originate from the white blood corpuscles, but whose observations were most strenuously opposed at first by the majority of the profession, who could not see it. It may be mentioned here, as it has some relation to Dr. Tanner's fast, by which fast the number of his white blood corpuscles was more than quadrupled. It is well known that persons subject to privation of food have a strong tendency to pus formation and running sores, and if starvation increases the number of white corpuscles, these combined facts appear to support Cohnheim's theory. The opposition against it was, however, set at rest by Dr. Bastian, in London, and Surgeon Woodward, U. S. Army in Washington, who verified Cohnheim's observation, and by Huxley, who adopted it in his great lecture on protoplasm.

The number of white corpuscles did rapidly diminish after the fast in Dr. Tanner's blood and was soon reduced to the normal proportion; but the interesting change in the red corpuscles and their very gradual restoration during a length of time, is a contribution to science which Dr. Tanner has given after the end of his fast, and this should be acknowledged.

LAKE LEMAN.

OVER thy bright blue bosom, placid lake,
I glide and sing a joyous song to thee!
'Tis eventide, and on thy shores I see
The phantom-lights: where thy clear waters break,
And ever and anon a murmur make.
While, by me wafts the wind so fresh and free,
And as I lean to watch the gurgling lee
The skies are mirrored, moving 'neath the wake.
By Chillon's walls I rest my oars, and dream
Of gory deeds and glory thou hast seen;
Which, thro' the vista of my vision gleam,
And gather forms, which picture many a scene:
'Mid pageantry of state a prisoner bleeds,
And shine brave Bonnivard's heroic deeds.

HENRY GEORGE HELLON.

Clarens.

NEW SYSTEM OF TANNING LEATHER.—An important step in advance has recently been made in Germany in the science and art of tanning leather, and within the last few months the system referred to has been practically worked out on a sufficiently large scale in a small experimental or exhibition tannery in Glasgow, erected for the purpose of demonstrating the value of the new process by the Eglinton Chemical Company, of Glasgow and Irvine, who have secured the sole control of the inventor's patents for the United Kingdom, Canada, and the British Colonies. The process is the invention of a German chemist, Dr. Christian Heinzerling, of Frankfort-on-the-Main, and seems destined to result in a total revolution in the system of tanning which has hitherto been in use and is truly time-honoured, inasmuch as it entirely dispenses with the ordinary tanning materials—oak-bark and other astringent vegetable products—and involves the use of inorganic chemical compounds only, the special member of which is bichromate of potash. Generally speaking, it may be said that the other compounds—all of which are readily soluble in water—have as their function the decomposition of the bichromate of potash, so as to set free its contained chromic acid, which is really the chemical agent that exerts the tanning effect on the tissue forming the corium or lower layer of the animal hide. There are many considerations which seem to justify us in expecting great results from the adoption of the Heinzerling process. One leading fact is that it requires for its completion a period of only from four to six weeks, whereas the bark-tanning process requires from twelve to twenty or occasionally even thirty months for its completion. It has already been adopted in fourteen tanneries in Germany, and is being introduced into Russia, France, and Italy.

THE PHOTOPHONE.

In May, 1878, Mr. Alexander Graham Bell, well known in connection with the telephone, announced before a scientific society in London his belief that it would be possible to hear a shadow by interrupting the action of light upon selenium. At the recent meeting of the American Science Association in Boston, Mr. Bell read a paper describing at length his experiments in the production and reproduction of sound by light, and the invention by Mr. Sumner Tainter and himself of an instrument for the purpose.

The influence of light upon the electric conducting power of selenium is well known. Mr. Bell found the electric resistance of same selenium cells of peculiar construction only one-fifteenth as much in the light as in the dark. It occurred to him that all the audible effects obtained in the telephone by variation of the electric current by sound waves, could also be produced by variations of light acting upon selenium; and that with suitable transmitting and receiving apparatus voices might be conveyed without a wire along a line of light.

The fundamental idea on which rests the possibility of producing speech by the action of light is the conception of what Mr. Bell terms an undulatory beam of light in contradistinction to an uninterrupted beam; meaning by the former a beam that shines continuously, but is subject to rapid changes of intensity.

The apparatus used to give the required undulatory character to light consists of a flexible mirror of silvered mica or thin glass. The speaker's voice is directed against the back of this mirror, as against the diaphragm of a telephone, and the light reflected from it is thereby thrown into corresponding undulations. In his experiments, chiefly with sunlight, Mr. Bell concentrates upon the diaphragm mirror a beam of light, which, after reflection, is again rendered parallel by means of another lens.

The beam proceeding from the transmitter is received at a distant station upon a parabolic reflector, in the centre of which is a sensitive selenium cell connected in a local circuit with a battery and telephone. In a recent experiment, Mr. Bell's associate operated the transmitting instrument, which was placed on the top of the Franklin school house, in Washington, about eight hundred feet distant from the receiver, placed in a window of Mr. Bell's laboratory. Through this distance messages were distinctly conveyed by means of light. In his laboratory experiments Mr. Bell finds that articulate speech can be transmitted and reproduced by the light of an oxyhydrogen lamp, and even by the light of a kerosene lamp.

The rapid interruption of the beam of light by a perforated disc gives rise to musical tones, siren fashion. With this apparatus silent motion produces sound, loud musical tones being emitted from the receiver when no sound is made at the transmitter.

The importance of these investigations it is impossible now to estimate. That the photophone can practically take the place of the telephone is not likely, though it is likely to work radical changes in military and other signalling operations. The heliograph, which has proved so useful in recent campaigns in the Afghan country and elsewhere, can now be made to talk orally yet silently over the heads of an enemy or across impassable streams or other low barriers. For rapid communication between distant exploring or surveying stations, the photophone also promises to be serviceable.

Another result of Mr. Bell's researches in this connection is the discovery that many other substances are sensitive to light. He has found this property in gold, silver, platinum, iron, steel, brass, copper, zinc, lead, antimony, German silver, Jenkins' metal, Babbitt's metal, ivory, celluloid, gutta percha, hard rubber, soft vulcanised rubber, paper, parchment, wood, mica, and silvered glass. The only substances found insensible to light are carbon and thin microscopic glass.

WELDING BY PRESSURE.

Pursuing his researches on the welding of solid bodies by pressure, M. Spring has subjected to various strong pressures (up to 10,000 atmospheres—150,000lb. per square inch) more than eighty solid pulverised bodies; this was done in vacuo, and in some cases at various temperatures. The results are highly interesting. All the crystalline bodies proved capable of welding, and in the case of bodies accidentally amorphous the compressed block showed crystalline fracture; crystallisation had been brought about by pressure. Softness favours the approximation of the particles and their orientation in the direction of the crystalline axes. The amorphous bodies, properly so-called, fall into two groups, one of substances like wax (*ciroid* bodies), which weld easily, the other of substances like amorphous carbon (*aciroid* bodies), which do not weld. The general result is that the crystalline state favours the union of solid bodies, but the amorphous state does not always hinder it. M. Spring says the facts described do not essentially differ from those observed when two drops of a liquid meet and unite. Hardness is a relative, and one may even say subjective term. Water may appear with a certain hardness to some insects, and if our bodies had a certain weight we should find the pavement too soft to bear us. Again, prismatic sulphur is changed by compression to octahedric sulphur; amorphous phosphorus seems to be changed to metallic; other amorphous bodies change their state, and mixtures of bodies react chemically if the specific volume of the product of the reaction is smaller than the sum of specific volumes of the reacting bodies. In all cases the body is changed into a denser variety, whence may be inferred that the state taken by matter is in relation to the volume it is obliged to occupy under action of external forces. This (M. Spring points out) is merely the generalisation of a well known fact. Some curious results are deduced from it. The researches described have important bearings on mineralogy and geology.

A Table Land Across the Gulf Stream.—In a recent dredging expedition from Charleston, S.C., across the Gulf Stream, Commander Bartlett, of the United States Coast Survey steamer Blake, was surprised to find the depths much less than he expected. This induced him, although the trip was one primarily for dredging, to extend the work of sounding; and he accordingly ran a line of soundings nearly along the warmest band of the Gulf Stream, commonly called the axis of the stream, for a distance of 150 miles from latitude 32° to latitude 33° 30 north, on which he obtained depths varying from 23[illegible] to 450 fathoms, where it was supposed that the depths would range from 600 to 1,000 fathoms. At the north-east end of this line, in about latitude 33° 30′ north, the depth suddenly increased, in a distance of 15 miles, from 457 to 1,386 fathoms. These depths obtained by Commander Bartlett appear to indicate that a submarine table land may extend from the coasts of North and South Carolina across to the Northern Bahamas. The development of this table land Superintendent Patterson proposes to have completed next spring, when the weather will be better adapted to such work than in the autumn and winter months.

A NEW PROCESS OF REFINING PETROLEUM.

The Philadelphia *Record* says that a new process for treating the products of petroleum is being tested in that city. At present all oils are brought to heat tests by distillation, and in the process lose from 30 to 65 per cent. By the old process oil at a fire test of 110° costs 6½ cents. per gallon. In bringing this grade of oil to a test of 150° it loses 30 per cent. in the process of distillation; to raise it to 175° it loses 45 per cent., and to 185° 65 per cent. By the new patent process the oil is treated without heat and loses nothing.

Oil at 110° that cost 5½ cents. per gallon, on being raised to a fire test of 150 is worth 13¼ cents. per gallon; to 175, from 15 cents. to 17 cents. per gallon, and if raised to 185° is worth from 18 to 20 cents. per gallon. The cost of raising it to any of these tests is 1 cent. per gallon. Here, also, is another advantage over the old system, as by the present method of distillation the profit on oil at a fire test of 110 is only half a cent. per gallon, and at a test of 150 the profit is the same; whereas by the new process, the oil losing nothing in the manipulation, the profit is in a ratio to the number of degrees to which the fire test is raised. In the process the oil is deodorised, and at the same time the illuminating quality is improved so that the oil burns longer and brighter, and this is effected without the aid of any heat whatever. This is what the inventors claim for the new process, but until a rigid and satisfactory test has been made they will disclose neither their plans nor their names.

A QUEER LOCOMOTIVE.

The *National Car Builder* condenses from the Paterson (N.J.) *Guardian*, a description of a new locomotive now in process of construction at the Grant Locomotive Works, which, it is thought, will eclipse for speed anything yet built. It will look like an ordinary engine turned upside down. The machinery will be on top of the boiler instead of under it, as usual, and the boiler will hang very low on the wheels. There will be two pairs of driving wheels, but instead of having them follow each other, one pair will be on top of the other. The real driving wheels will be the upper pair, and they will turn in the opposite direction from that in which the engine is going. They will rest upon the rims of the other pair, which will in turn rest on the track. The revolution of the upper pair, by friction, is expected to drive the lower pair, the tires of the latter serving as tracks for the upper ones. It is thought that a good deal greater speed can be got out of the machinery by this construction, and it is expected by the inventor that it will be the fastest locomotive ever made. Practical workmen, however, think it won't go at all. It will lock very funny as it is running through the country, with the upper pair of driving wheels, five feet in diameter, revolving up in the air in the wrong direction at a tremendous speed, and the eccentrics, rocking bars, link motion, and pistons on the top of the boiler.

Mr. Hollis C. Trout, of Minneapolis, Minn., has patented a receptacle for mail matter, so arranged that its interior can be quickly and easily inspected without opening the cover. The sides of the box are formed of wire gauze or of glass, or glass protected by an exterior covering of wire gauze or any material that will permit a quick inspection of the box through the sides. The box is intended principally for the use of residences and stores as a receptacle for newspapers, but it may also be used as a receptacle for other mail matter.